Introduction

Branch office networks and the enterprise WAN are in a state of dramatic transformation, driven by three key trends. Enterprises are using cost-effective Direct Internet Access (DIA) to replace expensive Multiprotocol Label Switching (MPLS) circuits. The advent of “as-a-service” providers has resulted in applications increasingly being hosted in the cloud, in either Infrastructure-as-a-Service (IaaS) or Software-as-a-Service (SaaS) delivery models. Software-defined WAN (SD-WAN), with its promise of service agility and orchestrated delivery, is redesigning branch routing and WAN connectivity. These trends mean that the perimeter of an enterprise is no longer confined to branch offices and data centers, but now encompasses the nebulous cloud.

All the above trends, while solving real business problems, have also given birth to new ones. Security, WAN optimization, visibility, scalable service delivery, and simplified IT operations become essential for this new landscape. While the business justification for moving to the cloud is increasing, the greater reliance on third-party infrastructure, networks, and applications should not be overlooked. Network visibility, application performance, and end-user experience have become new requirements and are more critical than ever.

The joint solution between ThousandEyes and the next-generation Cisco® 4000 Series Integrated Services Routers (ISRs) and 1000 Series Aggregation Services Routers (ASRs) tackles these exact challenges. Cisco’s virtualized, Network Functions Virtualization (NFV)-ready environment provides a flexible platform to deploy the ThousandEyes Network Intelligence solution. ThousandEyes provides network visibility and application-aware performance monitoring across all segments of a hybrid WAN, including both public and private cloud infrastructure. Together, this integrated solution lets you repurpose existing infrastructure to build an intelligent and cloud-aware WAN.
Challenges in a hybrid WAN

The one common thread in initiatives such as IaaS, SaaS, and SD-WAN has been the increased reliance and dependency on third-party networks and applications. Outsourcing services and relying on external service providers create intricate dependencies and visibility challenges that are often overlooked.

Distributed infrastructure and networks

The Internet has become the new backbone for enterprise communication. Yet the Internet remains a “best effort” network and a coalition of ISPs. In the traditional WAN, traffic mostly stayed within the enterprise and predominantly flowed via MPLS circuits with a guaranteed Service-Level Agreement (SLA). Despite the architectural changes in the WAN today, network engineers are still responsible for managing complex cloud environments while delivering a high-quality user experience. When the majority of the network is beyond your control perimeter, detecting and troubleshooting an issue is time intensive. Triaging routing inconsistencies or packet loss in peering and transit ISPs to identify the root cause is cumbersome. The race to lower the mean time to restore is competitive and commonly results in finger-pointing between teams or vendors.

Lack of visibility

With IaaS and SaaS, service delivery and application performance is a byproduct of network behavior. Traffic crosses multiple third-party networks in the public Internet before being delivered to the end user. Troubleshooting a sluggish Office 365 user experience or complex Cisco WebEx® connectivity becomes challenging when you don’t own the application or the underlying transport. Highly sensitive applications such as Voice over IP (VoIP) and video are now being delivered via the cloud, further complicating troubleshooting.

Traditional monitoring techniques such as flow monitoring, packet capture, and Simple Network Management Protocol (SNMP) fall short when it comes to providing visibility into third-party networks and SaaS applications. Moreover, flow and device statistics collected from routers and switches are typically analyzed in silos and fail to provide a unified view of service delivery.

Integrating visibility into a hybrid WAN

ThousandEyes Network Intelligence platform bridges the gap in traditional network monitoring to better suit the needs of today’s WAN. ThousandEyes delivers visibility for the hybrid WAN by monitoring every network segment and application your enterprise relies on. Software appliances known as Enterprise Agents probe the network at regular intervals to determine the health of the WAN. Data gathered through active monitoring is represented in intuitive visualizations and correlated across application, network, and routing layers. Enterprise Agents can be deployed in strategic locations within the enterprise, in branch offices, or in data centers to get a detailed understanding of end-to-end WAN topology, Internet connectivity, and application performance.
Monitor WAN connectivity and ISP performance

Enterprise Agents send specially crafted network packets – User Datagram Protocol (UDP), TCP, or Internet Control Message Protocol (ICMP) – to map traffic paths and measure the performance of links and interfaces along the path. Because active monitoring techniques are agnostic to the underlying network transport, Path Visualization can map the topology of the WAN and the Internet, providing a hop-by-hop view of the network and performance. When deployed in a full mesh capacity, Enterprise Agents can map bidirectional network paths and provide insights into network metrics such as loss, latency, and jitter in each direction (Figure 1). As it is likely that traffic flows extensively over the Internet in a hybrid WAN, visualizing external traffic paths and ISP outages will provide the right context while troubleshooting WAN connectivity.

Figure 1. Within the Level 3 network, Path Visualization detects 100 percent packet loss that is causing service disruption of Cisco WebEx at various branch offices.
Troubleshoot and optimize application performance

When you rely on the Internet to deliver SaaS services, application performance is tightly integrated with network behavior. ThousandEyes patented cross-layer correlation provides a unique perspective to application performance monitoring by correlating it with network performance. ThousandEyes measures application performance within the context of the infrastructure that helps pinpoint where in the service delivery stack an issue exists. Monitor page load times, HTTP server availability, or the complete lifecycle of a VoIP call to baseline, optimize, and troubleshoot application performance (Figure 2).

Figure 2. Monitor page load and HTTP availability from branch offices and data centers
Cisco 4000 Series and ASR 1000 Series routers: A new vantage point

Built on Cisco IOS® XE, a Linux-based operating system, the Cisco 4000 Series and ASR 1000 Series routers serve as a unique platform to integrate third-party applications. The NFV-ready platform provides an open environment for external applications to reside within existing infrastructure through Linux KVM-based virtualization, providing an alternative to Cisco UCS® blades. ThousandEyes Enterprise Agents are deployed as service containers on the 4000 Series ISRs and ASR 1000 Series routers (Figure 3). The integrated solution provides a unified, multiservice platform that acts as a WAN optimization engine, Internet security gateway, and network intelligence portal. All at the same time.

Figure 3. ThousandEyes integrated as an NFV application atop Cisco IOS XE

Benefits

- Gain visibility into service delivery from the WAN edge by colocating network monitoring with WAN optimization, routing, and SD-WAN capabilities.
- Leverage your investments by deploying ThousandEyes Enterprise Agents on existing Cisco hardware.
- Increase flexibility and promote portability of NFV applications through virtualization techniques.
- Map your enterprise topology and gain visibility into your hybrid WAN connectivity with network metrics such as loss, latency, and jitter.
- Detect ISP outages and precisely pinpoint problem areas inside and outside the WAN.
- Measure and optimize application (page load, HTTP, VoIP, FTP) performance of both internal and SaaS applications.

Prerequisites

- Cisco IOS XE version 3.17 or above on Cisco 4000 Series ISRs and ASR 1000 Series routers.
- NIM-SSD or MSATA-SSD on 4000 Series ISRs.
- Minimum 8 GB or 16 GB of installed memory on the Cisco 4000 Series and ASR 1000 Series, respectively.
Case study: How Cisco IT gains visibility into cloud services

The Cisco IT team is responsible for managing services widely used by Cisco employees and Cisco Technical Assistance Center (TAC) teams. The most critical and high-visibility applications, among the list of services managed by Cisco IT, are Salesforce and Cisco WebEx. In order to manage and troubleshoot these cloud-based solutions, Cisco IT needed a platform that could proactively provide visibility into network behavior and application performance within the Cisco network and the external cloud.

Cisco IT uses ThousandEyes Enterprise Agents to monitor business-critical services such as Salesforce and Cisco WebEx. Enterprise Agents are deployed as service containers on Cisco 4000 Series ISRs in strategically located offices, high priority-sales sites, and remote locations. With a hop-by-hop view of the network, along with metrics such as latency, packet loss, and Border Gateway Protocol (BGP) reachability, Cisco IT teams triage performance issues within minutes.

Andrea Di Lecce, senior program manager and a longtime ThousandEyes user, says, “In the era of cloud, both mean time to troubleshoot (MTTT) and Mean Time to Repair (MTTR) are equally important.” (Figure 4) Triaging a network issue and identifying the root cause is not the same as resolving the issue, as the fault could lie within an ISP or third-party vendor and the repair time could depend on multiple factors. Di Lecce says, “With ThousandEyes, Cisco IT has been able to reduce MTTT by 43 percent. That’s an outstanding achievement.” Apart from reducing troubleshooting time, the flexible deployment model of colocating ThousandEyes with Cisco 4000 Series ISRs has also reduced the number of devices that need to be managed.

Figure 4. In a cloud-centric environment, MTTT is a critical metric that IT teams should consider optimizing

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In a real-time outage that affected the performance of Cisco WebEx for internal Cisco users, Path Visualization was able to pinpoint the issue to increased packet loss in an internal network device (Figure 5). Within 90 minutes, Cisco IT was able to track down the device and successfully resolve the issue and restore service.

Figure 5. ThousandEyes Alerts proactively alert on packet loss to Cisco WebEx

Summary

The WAN retransformation is quickly changing the way networks and applications interact. The interdependence and vulnerability of the network is beyond the traditional enterprise perimeter. The joint solution between Cisco and ThousandEyes addresses the visibility challenges in the modern enterprise network while protecting existing infrastructure investments.

Visit https://www.thousandeyes.com/integrations/cisco and find out how you can start monitoring your WAN from existing Cisco infrastructure.